

(12) **UK Patent Application** (19) **GB** (11) **2 235 603 A** (13)
(43) Date of A publication 06.03.1991

(21) Application No 9012966.9
(22) Date of filing 11.06.1990
(30) Priority data
(31) 897944 (32) 09.06.1989 (33) KR

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(51) INT CL⁵
H04N 5/262
(52) UK CL (Edition K)
H4F FD12X FD2B FGG
(56) Documents cited
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(58) Field of search
UK CL (Edition K) H4F FGG FGH FGJ FGS FGT
INT CL⁵ H04N

(54) **Programmable superimposer**

(57) A video recorder, camcorder or image processing system is provided with a programmable mode in which a sequence of selected image superimposition steps is performed, each for a respective selected period, in response to a single depression of a key. The drawing shows the successive imposition of a first image, a second image, and the negative of the second image, on a main picture.



FIG. 1A

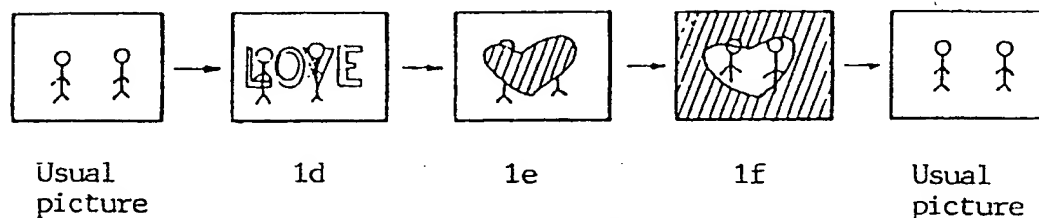


FIG. 1B

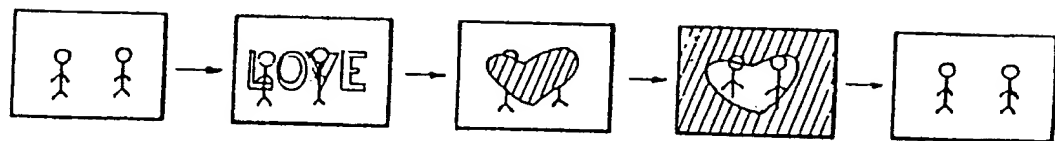


IMAGE #1



IMAGE #2

FIG. 1A



Usual
picture

1d

1e

1f

Usual
picture

FIG. 1B

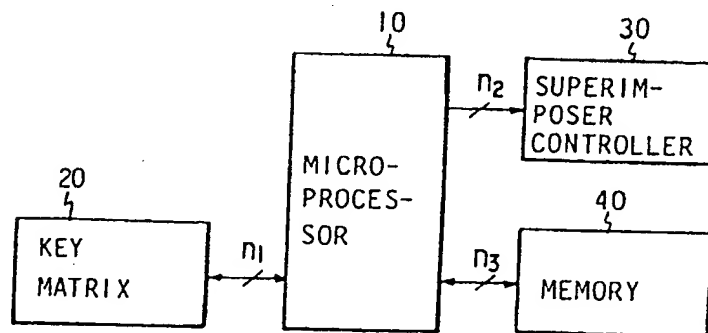


FIG. 2

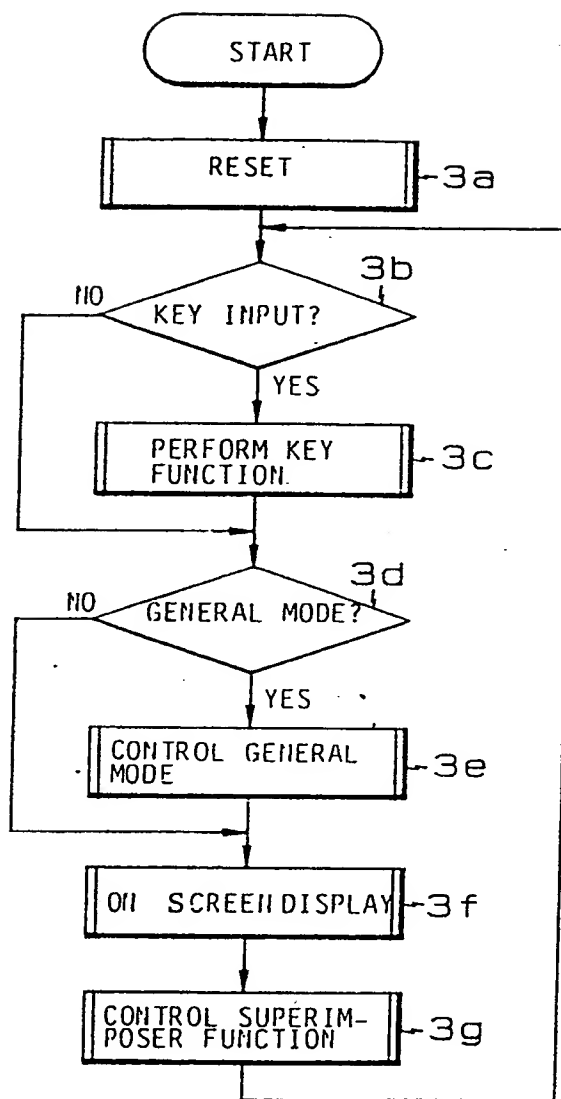


FIG. 3

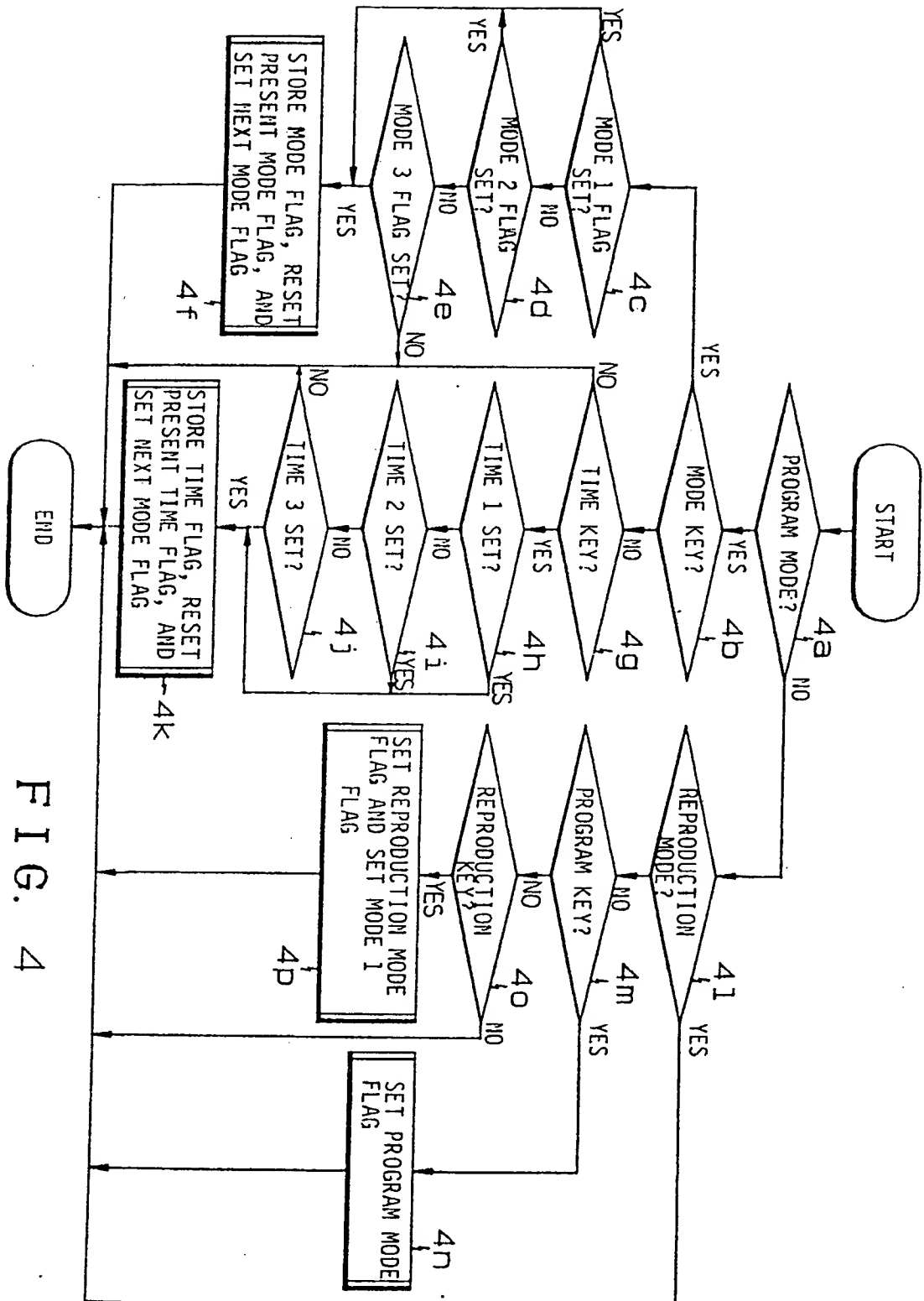


FIG. 4

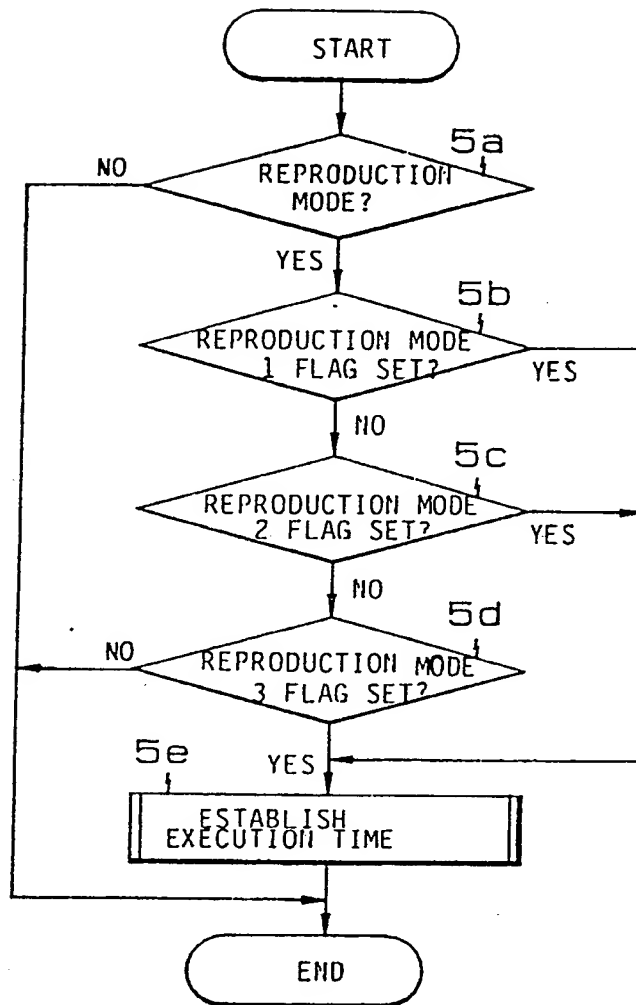


FIG. 5

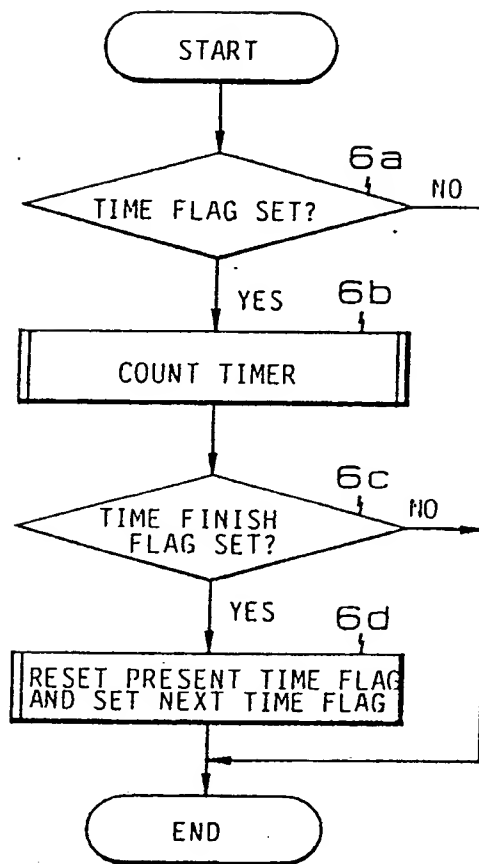


FIG. 6

PROGRAMMABLE SUPERIMPOSER

The present invention relates to a superimposer, for example, one which is used in a camcorder.

5

Generally speaking, a conventional camcorder refers to a video camera combined with a video tape recorder, and a conventional superimposer function is a function of the camcorder.

10

In general, typical examples of superimposer functions may include; a record function for recording a first and a second image in a memory, a read-out function for calling out recorded superimposed dialogue, a toggle function for reversing or obtaining the obverse of images, a scroll function for scrolling an image in one or more directions, and a curtain function for blanking out pictures or parts of pictures by covering them with an image of a single colour. In the conventional camcorder, each function is controlled by a corresponding superimposer function key which performs or suspends a corresponding superimposer function, and which must be pressed by the user when the corresponding superimposer function is required.

25

In order to edit diversified pictures, for example where two separate images are recorded page by page, if a user wants to keep on performing a series of superimposer functions, or wishes to call out a desired image with a scroll function after a certain time has lapsed, the user must manually press a key every time a superimposer function is to be changed.

30

Thus, the conventional camcorder heretofore described is inconvenient to use because, when simultaneously using

35

superimposer functions, video recording is accomplished intermittently, due in part, to the manual operation of the superimposer function keys.

5 Accordingly, one object of a preferred embodiment of the present invention may be to provide a method for processing and setting up a superimposer function key so that pictures can be edited continuously during video recording through a single input of that key.

10

 According to a first aspect of the present invention, there is provided a method of operating a programmable superimposer of a camcorder, said camcorder including a micro-computer, a key matrix, a superimposer controller
15 and a memory device, said method comprising the steps of:

(a) arranging for a key to be set for activation of a successive superimposer function, by storing a plurality of program modes with corresponding operating times
20 therefor; and

(b) a step for successively executing respective said modes within respective said corresponding operating times.

25

 Preferably said step (a) comprises the steps of:

 checking whether an input key indicates a program mode or not;

30

 if said input key does not indicate a program mode, checking whether said input key indicates a reproduction mode or not;

if said input key does not indicate a reproduction mode, setting a program mode flag, a mode 1 flag and a time 1 flag if there is an input from a program key, and setting a reproduction mode flag and a reproduction 1 flag
5 if there is an input from a reproduction key;

if there is a mode key input and a mode flag is set, storing said mode flag, resetting said mode flag, and setting a next mode flag;
10

if there is a said mode key input and a time flag is set, storing a time value, resetting a time flag, and setting a next time flag.

15 Preferably step (b) comprises the steps of:

if said input key indicates a reproduction mode, checking a reproduction mode flag and performing a corresponding reproduction mode; and
20

counting a respective mode performance time for an execution of said step, and performing a next mode if said time equals or exceeds a predetermined value.

25 Preferably said counting step comprises the steps of:

checking whether a timer is set to a set time or not;
and

30 if said timer is set to a set time, checking whether said set time is a time of a predetermined value;

if said set time is of said predetermined value, setting a corresponding mode completion flag, resetting a present time flag, and setting a next mode time flag.
35

According to a second aspect of the present invention, there is provided a video picture superimposer apparatus comprising a plurality of input keys, at least one superimposer circuit, at least one microcomputer, and
5 one or more memories, in which said superimposer circuit is arranged to perform a series of pre-defined superimposer functions in response to a signal from a programmable said input key.

10 Said series of predefined superimposer functions may be an edit function of said apparatus, and may be arranged to be performed simultaneously with a video picture record function, for continuous editing of a video picture during recording thereof.

15 The invention includes a video signal processing device which incorporates said video picture superimposer apparatus.

20 Said video signal processing device may be a camcorder or a video recorder.

The invention includes a method of operating a video picture superimposer apparatus in which a single input key
25 is arranged to activate a multiple step superimposer function.

The invention also includes a method of operating a programmable superimposer system to activate a multiple
30 step superimposer function in response to an input key, wherein said method comprises the stages of:

(i) Storing in a memory a sequence of various superimposer modes and/or corresponding respective
35 execution times therefor; and

(ii) Executing said sequence in response to an input from said input key.

Said multiple step superimposer function may comprise
5 a plurality of single superimposer functions, each
arranged to operate in a respective said superimposer
mode.

Preferably said superimposer modes are stored by
10 storage and/or setting and/or resetting of one or more
electronic flags representing said superimposer modes.

Said superimposer modes may include one or more of
the following; a Read mode, a Toggle mode, a Curtain mode,
15 a Record mode, a Scroll mode.

Preferably said superimposer modes have respective
corresponding superimposer functions of; a Read function,
a Toggle function, a Curtain function, a Record function,
20 a Scroll function.

Said programmable superimposer system may be arranged
for continous editing of a video picture simultaneously
with recording thereof.
25

For a better understanding of the invention and to
show how the same may be carried into effect, reference
will now be made, by way of example, to the accompanying
diagrammatic drawings, in which:
30

Figures 1A and 1B are illustrations of one example of
a 5-step function as may be required for a superimposer to
perform;

Figure 2 is a block diagram of a programmable superimposer system according to a preferred embodiment of the present invention;

5 Figure 3 shows a flow chart of a routine according to a preferred method of the present invention for operating a camcorder, including control of a programmable superimposer system;

10 Figure 4 is key function performance routine according to a preferred method of the present invention;

 Figure 5 is a routine for implementing a mode and for establishing an execution time for performing a mode,
15 according to a preferred method of the present invention;
 and

 Figure 6 is a routine according to a preferred method of the present invention for interruption of a timer when
20 a mode is performed.

 Referring to figure 2 of the accompanying drawings, a programmable superimposer system, for example as may be used in a camcorder or video recorder unit, includes a
25 microcomputer 10 which controls the general operation of the system, a key matrix 20 for input of a required function and execution time information input by a user, a superimposer controller 30 for controlling various superimposer functions, and a memory 40 for storing
30 various functions and the necessary execution times of these functions.

 The superimposer system can operate in various modes, for example, a Program Mode in which a number of Usual
35 Modes such as a Read mode, Toggle mode, a Record mode, a

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Scroll mode, a Curtain mode or various other modes, and the execution times therefore, may be programmed into the memory 40 via the key matrix 20 and microprocessor 10. A superimposer may perform various functions corresponding to a particular usual mode, for example when in Read mode, the system may control the superimposer to perform a Read function, and similarly for other usual modes.

Referring to figure 3 of the accompanying drawings, the usual operation of a camcorder is as follows:

A camcorder operating routine starts with Step 3a in which camcorder parameters and system information are reset. In Step 3b, a key scan operation is executed to check whether or not there is any input from one or more camcorder keys. If there is an input from a camcorder key, the routine advances to Step 3c and one or more functions in accordance with a camcorder are performed. In step 3c, various operations may be performed, such as determining an operating mode of the camcorder (or a system thereof, such as a programmable superimposer system as described herein above), determining which type of key and/or input is active, and setting and storing flags which relate to various modes and functions of the keys and key inputs identified in the step 3c.

If there is no key input at Step 3b or the function of a key is completed in Step 3c, the routine proceeds to Step 3d in order to decide whether or not the camcorder is ready to perform a General Mode.

If it is determined at step 3d, that the General Mode is to be performed, the General Mode is controlled at Step 3e of the routine. If it is determined at Step 3d, that the General Mode is not to be performed, or that execution

of the General Mode at Step 3e has been completed, an on-screen display (OSD) and/or other display are carried out at Step 3f. Following execution of Step 3f, the routine proceeds to step 3g, in which a superimposer
5 function is controlled, following which, execution of the routine returns to Step 3b, and further cycles of the routine are carried out.

Referring to Figure 4 of the accompanying drawings,
10 operation of a key function performance routine is now described.

When a key is activated, an input of the key input is sensed by a key-scan operation, for example one which
15 occurs at Step 3b in Figure 3, and the operation of a corresponding key function is performed at Step 3c through a key function performance routine, one example of which is shown in Figure 4.

20 In general, the routine determines whether or not a system is in a Usual mode, a Reproduction mode, or a Program mode. If the system is not in a Reproduction or Program mode then the system is either in a Usual mode, or a Time key has been activated, or the system is in some
25 other mode, for example a General mode. The routine also determines whether a key input is from a Program key, a Reproduction key, a Usual mode key or a Time key, and sets and/or stores various flags according to the various above modes which the system is in and/or the various key inputs
30 determined. A more detailed description of the key function performance routine is now described:

It is determined whether a Program Mode is presently activated by checking a Program Mode flag at Step 4a. If
35 the program mode is not presently activated, it is

determined at Step 4l whether a Reproduction Mode is presently activated or not, by checking a Reproduction Mode flag.

5 If the system is in a Usual mode, it is determined at Step 4m whether the presently activated key is a Program Key or not. If the presently activated input key is a Program Key, a Program Mode flag is set at Step 4n. If the presently activated key is not a Program Key, it is
10 determined at Step 4o whether the presently activated key is a Reproduction Key or not. If the presently activated key is not a Reproduction Key, a cycle of the routine is terminated at step 4o. If the presently activated input
15 key is a Reproduction Key, a Reproduction Mode flag is set at step 4p, and in order to indicate that it is a first mode to be performed, a Mode 1 flag is also set at Step 4p.

 If, at Step 4a, it is determined that a Program mode
20 is presently activated it is then determined at Step 4b whether the presently activated key is a Usual Mode key or not. If the present input key is determined to be a Usual Mode key, it is checked which mode flag is set at Steps 4c to 4e. If, at step 4c, it is determined that Mode 1 flag
25 is not set, it is determined at Step 4d whether or not a Mode 2 flag is set. If the mode flag checked at Step 4d is not the Mode 2 flag, it is checked whether a Mode 3 flag is set or not. If it is determined that the Mode 3 flag is not set, then a cycle of execution of the routine
30 finishes at Step 4e.

 If, however, it is found in any of steps 4c, 4d or 4e respectively, that any one of the Mode 1 flag, the Mode 2 flag or the Mode 3 flag have been set, then in step 4f,
35 operations of storing the respective Mode flag into a

corresponding memory, resetting the respective presently activated Mode flag, and setting a respective next Mode flag are performed.

5 If, it is found in step 4b that the presently activated key is not a Usual Mode Key, but that the system is in Program mode, then in step 4g it is determined whether the presently activated key is a Time Key or not. If the presently activated key is not a Time Key,
10 execution of a cycle of the routine is terminated.

 If it is found that the presently activated key is a Time Key, it is checked whether a Time 1 flag is set or not at Step 4h. If the Time 1 flag is not set, it is
15 checked at Step 4i whether the Time 2 Flag is set. If the Time 2 flag is not set, at step 4j it is checked whether a Time 3 flag is set or not. If the Time 3 flag is not set either, execution of a cycle of the routine comes to an end.

20

 If, however, it is found that any Time flag is set in any one of steps 4h, 4i or 4j respectively, corresponding execution times are stored in a corresponding Time Memory, the present Time flag is reset, and then a next Time flag
25 is set at Step 4k.

 Referring to figure 5 of the accompanying drawings, a routine for establishing whether an execution time for performing a mode is to be set or not is described. Such
30 a routine may, for example, be performed after a Reproduction key has been activated, as determined in steps 4a to 4e of the key function performance routine of figure 4 described hereinabove.

The execution time establishing routine of figure 5 serves to check whether or not a system is in a Reproduction Mode or not, and if so, which Reproduction mode flag is set. If a mode flag is set, the Reproduction mode is performed, and a corresponding Time flag is set. A more detailed explanation of the execution time routine now follows:

If at step 5a, a mode is checked, and is determined to be Reproduction mode, it is determined at step 5b whether a Reproduction Mode 1 flag is set or not. If the Reproduction Mode 1 flag is set, a corresponding mode is performed at Step 5e.

If it is found that the Reproduction Mode 1 flag is not set at Step 5b, at Step 5c it is checked whether the Reproduction Mode 2 flag is set or not. If the Reproduction Mode 2 flag is not set either, it is checked at Step 5d whether the Reproduction Mode 3 flag is set or not.

When any one of the above Reproduction Mode flags is set, the corresponding Reproduction Mode is performed, and a corresponding Time flag is set in Step 5e in order to establish an execution time for the corresponding Reproduction Mode.

Referring to figure 6 of the accompanying drawings, a timer routine is required to count an execution time corresponding to each mode.

At Step 6a, if a Time flag is set, for example, by a setting operation as occurs as a result of the above described execution time routine, or as a result of Step 4k of the above described performance routine, a set time

is counted by a Count Timer at Step 6b. At step 6c, it is checked whether the Count Timer has finished counting, by checking if a Time Finish flag is set. Setting of the Time Finish flag indicates that execution of a corresponding Mode is finished. At the same time, preparations are made for execution of a subsequent mode by resetting a corresponding Time flag and by setting the next Time flag in step 6d.

By way of example, an operation of the programmable superimposer system and various routines described hereinabove will now be described with reference to figures 1 to 6 of the accompanying drawings:

In the operation, three Modes (Read 1, Read 2, and Toggle) are stored in the memory 40 in order to effect a 5-step function, an example of which is as illustrated in Figure 1B.

Referring to figure 1B of the accompanying drawings, the 5-step function commences with a usual video picture. In a Read 1 mode, a first image (image #1 in figure 1A) is read to the usual picture at step 1d, resulting in the first image being superimposed onto the usual picture. In a Read 2 mode, a second image (image #2 in figure 1A) is read to the usual picture, in step 1e, resulting in the second image being superimposed onto the usual picture. In a Toggle mode, the second image is replaced by the obverse of the second image in step 1f, and at a fifth step, the usual picture is recovered.

Although three modes are presupposed herein, in the operation of the preferred embodiment of the present invention a user may vary the type and the number of

modes, and the invention is in no way restricted to the three modes described herein.

5 The programmable superimposer system can be programmed to activate a continuously variable superimposer function for example, the 5-step function shown in Figure 1b in response to a single input key, as follows:

10 First of all, a user activates a program key. Then a microcomputer 10 considers the current mode of the system as a usual mode at Steps 4a, and 4l of Figure 4. At Step 4m, the microcomputer recognizes that the input key is a Program mode key. The microcomputer then
15 proceeds, at Step 4n, to set a Program Mode flag, a Mode 1 flag, and a Time 1 flag upon which a cycle of the flag setting and storage routine is terminated.

20 Next, the user inputs a first Read key (Read 1) in order to store the first mode (the Read mode) which is to be performed in the programmed superimposer function. In a second cycle of the flag setting and storage routine, at step 4a, the microcomputer 10 determines that the Program Mode flag is set and that a Program Mode is therefore
25 operating. The microcomputer then judges at Step 4b whether the input key is a usual mode key or not (i.e. a usual mode key being for example a Read key, Scroll key, Curtain key, Record Key, Toggle key or other key relating to a single step superimposer function).

30

 If at step 4b, it is determined that the input key is a usual mode key, step 4c is executed to decide whether a Mode 1 flag is set or not. If the Program Mode flag has been set at Step 4n, the microcomputer determines at Step
35 4c that the mode 1 flag is set. At Step 4f, data of the

first Read Mode, which is the first mode to be performed, is stored in the memory 40, the Mode 1 flag is reset, and a Mode 2 flag is set to enable storage of a second mode to be performed.

5

After the first mode to be performed is stored as described hereinbefore, the user decides whether the next step to perform is storing of a second usual mode, or storing of an execution time for the first mode.

10

If the user inputs a Time key for storing the execution time of the first mode (first Read Mode) in advance of inputting a second usual Mode key, the microcomputer recognises at Step 4g that the input key is a Time Key, and determines at Step 4h whether a Time 1 flag is set or not.

If it is determined at step 4h that a Time 1 flag has been set, the routine execution goes to Step 4k. At step 4k, an execution time for the first mode (first Read mode) is stored, and a Time 2 flag is set in order to store the execution time for the second usual mode. A second cycle of the flag setting routine is completed therein.

Next, in order to store the second Read Mode (Read 2) and its execution time, in a third cycle, the routine follows the steps 4a -> 4b -> 4c -> 4d -> 4e after input from a second Read Mode key. Then, at Step 4f the microcomputer writes data relating to the second Read Mode in the memory, and resets a Mode 2 flag. (Which is now the present Mode flag). Then, the microcomputer makes preparations to store a third mode to be performed by setting a Mode 3 flag (which is now the next Mode flag) and the third cycle of the routine comes to an end.

35

If a Time Key for the second read mode, is then activated by a user, in a fourth cycle of the routine, the steps 4a -> 4b -> 4g -> 4h -> 4i -> 4k are followed. The execution time of the second read mode is written to the memory 40, a Time 2 flag is reset and a Time 3 flag (which is how the next Mode flag is set). The fourth cycle of the routine then comes to an end.

Next, operations for a Toggle mode and an execution time therefor are attained by proceeding through the steps 4a -> 4b -> 4c -> 4d -> 4e -> 4f and steps 4a -> 4b -> 4g -> 4h -> 4i -> 4j -> 4k, respectively.

After a key for a continuously changeable multiple step function has been defined as described hereinabove with reference to Figure 4, the continuously changeable multiple step function can be performed as follows: When the user inputs a Reproduction Key, the microcomputer 10 recognizes that the reproduction key is presently activated at Step 4o after the route 4a -> 4l -> 4m -> 4o, in Figure 4 has been followed. The microcomputer then sets a Reproduction Mode flag and a Reproduction Mode 1 flag at Step 4p.

When the microcomputer 10 recognizes that the presently activated key is a Reproduction Key by the procedure of steps 4a -> 4l, it is determined at Step 5b, in Figure 5, whether a Reproduction Mode 1 flag is set. Since the Reproduction Mode 1 flag is set at Step 4p, the first read mode (Read 1) is performed at Step 5e.

At step 5e, the microcomputer 10 also checks the execution time of the first read mode by the timer interrupt routine of Figure 6. It is checked at Step 6c whether a Time Finish flag is set in order to indicate

that execution of the first read mode is finished, and then the second Read Mode (Read 2) flag is set at Step 4k.

5 A Toggle mode is performed in the same way as the first Read mode (Read 1) after performing the second read mode.

10 The above described preferred embodiment of the present invention may overcome the abovementioned inconvenience of a conventional camcorder by previously programming a desired superimposer function or series of functions, and by storing the time required to accomplish each superimposer function.

15 The preferred embodiment of the present invention may also have an advantage in that a series of a superimposer functions can be continuously performed with a single key input, by programming a desired operation in advance.

20 The foregoing description shows only a preferred embodiment of the present invention. Various modifications are apparent to those skilled in the art without departing from the scope of the present invention which is only limited by the appended claims. Therefore,
25 the embodiment shown and described is only illustrative, not restrictive.

30 Whilst methods and apparatus have been described hereinabove predominantly with reference to a camcorder, the invention is not restricted to such apparatus, but is also intended to apply to any other video systems, for example a video recorder or a video image processing system.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS:

1. A method of operating a programmable superimposer of a camcorder, said camcorder including a micro-computer, a key matrix, a superimposer controller and a memory device,
5 said method comprising the steps of:

(a) arranging for a key to be set for activation of a successive superimposer function, by storing a plurality
10 of program modes with corresponding operating times therefor; and

(b) a step for successively executing respective said modes within respective said corresponding operating
15 times.

2. A method of operating a programmable superimposer according to claim 1, wherein said step (a) comprises the steps of:

20 checking whether an input key indicates a program mode or not;

if said input key does not indicate a program mode,
25 checking whether said input key indicates a reproduction mode or not;

if said input key does not indicate a reproduction mode, setting a program mode flag, a mode 1 flag and a
30 time 1 flag if there is an input from a program key, and setting a reproduction mode flag and a reproduction 1 flag if there is an input from a reproduction key;

if there is a mode key input and a mode flag is set, storing said mode flag, resetting said mode flag, and setting a next mode flag;

5 if there is a said mode key input and a time flag is set, storing a time value, resetting a time flag, and setting a next time flag.

3. A method of operating a programmable superimposer according to Claim 1, wherein said step (b) comprises the steps of:

15 if said input key indicates a reproduction mode, checking a reproduction mode flag and performing a corresponding reproduction mode; and

counting a respective mode performance time for an execution of said step, and performing a next mode if said time equals or exceeds a predetermined value.

20

4. A method of operating a programmable superimposer according to Claim 3, wherein said counting step comprises the steps of:

25 checking whether a timer is set to a set time or not; and

if said timer is set to a set time, checking whether said set time is a time of a predetermined value;

30

if said set time is of said predetermined value, setting a corresponding mode completion flag, resetting a present time flag, and setting a next mode time flag.

5. A video picture superimposer apparatus comprising a plurality of input keys, at least one superimposer circuit, at least one microcomputer, and one or more memories, in which said superimposer circuit is arranged to perform a series of pre-defined superimposer functions in response to a signal from a programmable said input key.
6. A video picture superimposer apparatus according to claim 5 in which said series of predefined superimposer functions is an edit function of said apparatus, and is arranged to be performed simultaneously with a video picture record function, for continuous editing of a video picture during recording thereof.
7. A video signal processing device which incorporates a video picture superimposer apparatus according to claim 5 or 6.
8. A video signal processing device according to claim 7, which is a camcorder or a video recorder.
9. A method of operating a video picture superimposer apparatus in which a single input key is arranged to activate a multiple step superimposer function.
10. A method of operating a programmable superimposer system to activate a multiple step superimposer function in response to an input key, wherein said method comprises the stages of:
- (i) Storing in a memory a sequence of various superimposer modes and/or corresponding respective execution times therefor; and

(ii) Executing said sequence in response to an input from said input key.

11. A method according to claim 10, wherein said multiple
5 step superimposer function comprises a plurality of single
superimposer functions, each arranged to operate in a
respective said superimposer mode.

12. A method according to claim 10 or 11 in which said
10 superimposer modes are stored by storage and/or setting
and/or resetting of one or more electronic flags
representing said superimposer modes.

13. A method according to any one of claims 10, 11 or 12,
15 wherein said superimposer modes include one or more of the
following; a Read mode, a Toggle mode, a Curtain mode, a
Record mode, a Scroll mode.

14. A method according to claim 13, wherein said
20 superimposer modes have respective corresponding
superimposer functions of; a Read function, a Toggle
function, a Curtain function, a Record function, a Scroll
function.

25 15. A method according to claim 13 or 14 in which said
programmable superimposer system is arranged for continuous
editing of a video picture simultaneously with recording
thereof.

30 16. A programmable superimposer system substantially as
hereinbefore described with reference to Figures 1 to 6 of
the accompanying drawings.

17. A method of operating a programmable superimposer system substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.

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